WESTERN BIRDS

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BIRDS

Vol. 5, No. 4, 1974

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Quarterly Journal of California Field Ornithologists

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Volume 5, Number 4, 1974

Western Bird Photographers *Arnold Small* 101

Identification of the Yellow-billed Loon (*Gavia adamsii*) *Lawrence C. Binford and J. V. Remsen, Jr.* 113

Breeding of Great Blue Herons and Great Egrets at Audubon Canyon Ranch, California, 1972-1973 *Helen M. Swarth* 127

NOTES

First Oregon Records for Thick-billed Murre *J. Michael Scott and Harry R. Nehls* 135

Barred Owl Sightings in Washington *Timothy A. Manson* 136

INDEX 141

Layout and cover design by Virginia P. Johnson.

WESTERN BIRDS

Volume 5, Number 4, 1974

WESTERN BIRD PHOTOGRAPHERS

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This is the second of a series of pictorial essays by western bird photographers. Readers will note that the photographic editor chose himself as the subject for this issue (a useful prerogative). I have been photographing birds and other wildlife subjects for more than 20 years. During this time I have accumulated reasonably good portraits of about 1000 species of birds, of which more than 400 were photographed in North America. Many of my pictures have appeared in books and magazines and the culmination of this effort was reached in March 1974 with the publication of *The Birds of California* (Winchester Press, N. Y.) in which 304 of California's birds are illustrated.

Since July 1942, when House Sparrow became number one on what was to become a ballooning life list, I have been pursuing and watching birds for sheer pleasure and with undiminished zeal. Without this incentive, I doubt that I would have visited those faraway places nor seen the sights it has been my good fortune to have done. Nor would I have met and befriended those people whom I consider to be among the finest in the world—ornithologists, both amateur and professional.

I consider birds to be among the most difficult of photographic subjects to deal with. Most are shy and elusive, in addition to being among the most mobile animals on earth. With senses keener than many other vertebrates and alertness to match, they are most difficult to approach. For this reason, special equipment and techniques must be employed to capture them on film.

Most bird photographers eventually settle upon a standard set of equipment (including telephoto lenses of various focal lengths, electronic flashes, 35 mm single-lens reflex cameras, blinds to hide in, tripods, shoulder-pods, and the other usual paraphernalia of the field nature photographer), but to achieve more than mediocre success requires additional assets not obtainable in the photo store—patience, skill, and a thorough knowledge of the subject. I confess to incomplete mastery of these attributes but will admit to improvement in all of them over the last 20 years.

I have selected photographs of eight of the 13 species of owls known to occur in California. The set is still incomplete because I have no photographs of one of California's most abundant owls (Screech) nor one of its rarest and shyest (Flammulated). Owls are intriguing yet frustrating birds to study and photograph. Their extraordinary adaptations—cryptic camouflage, immobility, remarkable vision and hearing—and the denseness of the habitats of some, makes everyone's life list of owls rather short. For example, of the 123 typical owls (Strigidae) in the world, I have seen but 31 or about 25%. On the other hand, of the 205 species of Old World vultures, eagles, hawks and kites (Accipitridae), I have seen 119 or 59% and of the 58 Falconidae, I have seen 39 or 67%.

The photograph of the Barn Owl was obtained in the simplest possible way—by merely walking slowly up to it and snapping the shutter a few times. It was really a bit more complicated than that because it involved *stalking,* a useful and often successful technique if the photographer wears clothing of a subdued hue, stalks slowly, moving only when the bird closes its eyes or looks away, and makes no loud noises or quick sudden movements. This owl was sitting adjacent to its cave nest and was about 30 feet away when photographed.

The Great Horned Owl was sitting in a leafless cottonwood near Honey Lake, Lassen County. Great Horned Owls tend to be rather fearless anyway and the biggest problem was obtaining a clear angle of view through the interlocking branches.

We located the nest of the Elf Owl by playing the tape recording of its own voice recorded earlier. It was territorial and my son Brian soon found the nest hole about five feet high in a Desert Willow. It must be one of the very few pairs nesting in California. Brian held a flashlight on the bird while I focused and operated the camera and electronic flash. This bird appeared to have lost its mate in 1974, as we spent several nights trying to locate another bird, but to no avail.

The Pygmy Owl was induced to come into the open by whistling an imitation of its call during the late afternoon in Yosemite Valley. It flew to a nearby fir tree and allowed me to approach to within three feet.

The Spotted Owl photograph was the result of a combined undertaking. We found it roosting high in an Incense Cedar in Icehouse Canyon, San Bernardino County. Conditions for photography were further complicated by the fact that this tree was situated on a steep and rotten slope. A rickety long ladder was located, carried into position and anchored loosely to the tree, and my companion climbed to the topmost rung carrying the electronic flash head. By standing on tiptoe, holding the flash high, and clinging for dear life to the tree trunk, he was able to elevate the flash head high enough for photography.

In California, Long-eared Owls generally prefer riparian situations. The bird photographed was one of a pair nesting near Arvin, Kern County and was not unduly alarmed at my approach. I suspect that it was the male as the other bird (presumably the female) was incubating on the nearby nest.

The Short-eared Owl photograph was the result of the only good opportunity I have ever had to photograph this bird at close range. Short-eared Owls, being open country birds, are rather more wary than other owls and do not allow a close approach. This bird was located on a post at Upper Newport Bay, Orange County. We elected to approach it slowly by car and by shielding the backside windows with blankets, were able to reduce the appearance of motion within the vehicle, which in effect became a rolling bird blind.

The Great Gray Owl photograph is one of several attempts. This bird (the second state record for Washington) was stalked at the edge of a mountain meadow. Great care was employed as it had flushed too soon on several previous occasions. Now it was at the end of the meadow and another flush would send it into the deep forest. The sunshine on this bird was almost more unusual than the bird itself because these were the last rays of a setting sun, which itself is but rarely viewed in Washington in December. Another time, with another Great Gray Owl, I employed the services of a caged mouse to lure it out of the forest and into photographic position. However, I failed because at the critical moment of kill and consumption I found that I had exhausted my film.

All of the photographs were Kodachrome II originals in color. They were copied onto Kodak Plus-X black and white film and enlargements were made from the negatives.

BARN OWL (*Tyto alba*), Cholame, San Luis Obispo County, California, 9 May 1968; 640 mm lens, 1/125 second at F9.0.

GREAT HORNED OWL (*Bubo virginianus*), Honey Lake, Lassen County, California, 29 December 1970; 500 mm lens, 1/125 second at f4.5.

ELF OWL (*Micrathene whitneyi*), Desert Center, Riverside County, California, 20 April 1973; 300 mm lens, electronic flash at f8.0.

PYGMY OWL (*Glaucidium gnoma*), Yosemite Valley, Mariposa County, California, 16 July 1969; 135 mm lens, electronic flash at f8.0.

SPOTTED OWL (*Strix occidentalis*), Icehouse Canyon, San Bernardino County, California; 500 mm lens, electronic flash at f4.5.

LONG-EARED OWL (*Asio otus*), near Arvin, Kern County, California; 300 mm lens, 1/125 second at f5.6.

SHORT-EARED OWL (*Asio flammeus*), Upper Newport Bay, Orange County, California, 20 March 1972; 1/125 second at f4.5..

GREAT GRAY OWL (*Strix nebulosa*), near Hamilton, Washington, 21 December 1973; 500 mm lens, 1/60 second at f4.5.

IDENTIFICATION OF THE YELLOW-BILLED LOON (*GAVIA ADAMSII*)

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The recent increase in sightings of Yellow-billed Loons (*Gavia adamsii*) along the Pacific coast of the contiguous United States (Remsen and Binford MS) has necessitated a revaluation of the characters used for identification, both in the field and in the hand. Field guide treatment is often inaccurate and invariably incomplete, especially in regard to birds in gray-brown plumage. The more technical literature not only is widely scattered and poorly digested for use in modern field identification, but also neglects some of the most important distinguishing characteristics. Confusion on the part of some ornithologists has led to the misidentification of museum specimens, including a supposed Yellow-billed Loon from Colorado (Remsen and Binford MS).

The following discussion is based on published literature; specimens in the California Academy of Sciences, San Francisco (CAS), and the Museum of Vertebrate Zoology, Berkeley (MVZ); published and unpublished photographs of living birds; communications with birders; notes in the files of regional editors of *American Birds*; and our own field experience. Comparisons are confined to the Common Loon (*Gavia immer*), the only species with which confusion is likely. The reader is referred to Figures 1 (*adamsii*) and 2 (*immer*), which depict some of the distinguishing characteristics discussed below. The timing and sequence of molts and plumages are nearly identical in the two species (Godfrey 1962) and thus are of no use in field separation. Both species are sexually monomorphic except in size.

IDENTIFICATION IN THE FIELD

The following discussion, which treats the characters useful in distinguishing Yellow-billed from Common loons in the field, is divided into three parts: characters other than plumage color; plumage color in breeding adults; and plumage color in gray-brown birds.

CHARACTERS OTHER THAN PLUMAGE COLOR

Bill color. The most important field mark in separating Yellow-billed and Common loons, and the only one that is diagnostic in all ages and plumages, is the color of the culmen (ridge of upper mandible). In breeding-plumaged adults the bill of the Common Loon is all black, while that of the Yellow-billed is whitish yellow, often tending to pale brownish or dark grayish at the base of both mandibles (especially from the base of the culmen to the nostrils). In winter adult *immer* the major portion of the bill becomes pale grayish, tinged usually with bluish but sometimes brownish or even ivory; the entire culmen, plus some 5 mm (at the base) on each side, remains black. The bill of adult *adamsii* also

Figure 1. Yellow-billed Loon in gray-brown (immature) plumage. Note the following and compare with Figure 2: mostly *pale culmen*; recurved lower outline of mandibular ramus; bill gap (only partially visible); chin feathering extending to point below posterior edge of nostril; pale posterior auricular region and neck sides, blending with white of underparts and reducing dark of occiput and hindneck to narrow strip; pale face, with whitish extending to above eye; discrete *auricular patch*; small eye; thick neck with proportionately small head. The crossbanded mantle is readily apparent in the specimen but not in the photograph. Note also the similarity to the Common Loon in curvature of culmen, degree of angularity between gonys and mandibular ramus, and absence of gonydeal protuberance. Photographed near Inverness, Marin Co., California on 9 December 1967. From Small, A., *The Birds of California*, Winchester Press, New York, 1974.

Photo by Arnold Small

becomes paler in winter—yellowish white, or white with a yellowish, greenish, or brownish tinge. The base (including the basal half or less of the culmen) remains dark. Gray-brown immatures of both species resemble winter adults, except that in the Yellow-billed Loon the dark of the base may be slightly more extensive, sometimes reaching the halfway point on the culmen; Jehl (1970) described this dark area as "bluish" in his first-winter specimen of *adamsii* from Baja California (San Diego Natural History Museum 36831).

The important fact to note here is that in all ages and plumages of the Common Loon, black covers the *entire* culmen from base to tip (or to within 3-4 mm of the tip) and extends ventrolaterally for several millimeters. In *adamsii* the distal half or more (usually the distal two-thirds) of the culmen is pale, and only the basal portion is dark; gradation between the two colors is even and is always completed basally to

Figure 2. Common Loon in gray-brown plumage. Note the following and compare with Figure 1: Mostly *dark culmen*; decurved lower outline of mandibular ramus; dark posterior auricular region and neck sides, rather sharply defined from white of underparts and not seeming to reduce width of occiput and hindneck; moderately dark face, with dark lores and postocular region; no discrete auricular patch (dark area in this photograph is more posterior and merges with dark occiput); large eye; thin neck with proportionately large head. Photographed at Oxnard, Ventura Co., California on 12 February 1970.

Photo by Arnold Small

the midpoint of the culmen. Because in *immer* the ventrolateral extent of the black narrows toward the tip, field observers should attempt to obtain a front or top view of the culmen, although careful scrutiny from the side usually is sufficient.

Inexperienced observers often are led astray by the color of the lower mandible and sides of the upper mandible of gray-brown Common Loons; these areas may be so pale gray or ivory-tinged as to appear, at least in certain lights, similar in color to the bill of *adamsii* (Figure 2). An occasional museum specimen of *immer* exhibits a pale streak at the center of the culmen, with black toward the base and tip (CAS 15756); we have not observed this condition in the field and suspect that it is an artifact of skins; in any event, such a bird should not cause confusion, because most of the distal half of the culmen is black. The all-dark bill seen rarely in the study skin of *adamsii* (SDNHM 36831) is an artifact.

Bill shape: adults. In the field the unique bill shapes of adult *adamsii* and *immer* are readily apparent to an experienced observer. However, the seven specific characteristics that contribute to this distinctiveness are obscure and are detectible, if at all, only through very careful scrutiny at extremely close range. They are useful only in combination, for each is shared by occasional individuals of the other species. These seven characters of adult bills, plus another erroneously attributed by the literature, are discussed below. Numbers refer to Figure 3. The terms *decurved* (the ends of the line under discussion point ventrally) and *recurved* (ends of the line point dorsally) are used instead of convex and concave, the meaning of which is dependent on the relationship of the subject line to the whole.

(1) The swelling near the base of the culmen frequently is slightly more pronounced in *adamsii*. (2) The distal 15-37 mm of the culmen in *adamsii* is only slightly decurved, rather than strongly decurved as in *immer*. (3) Usually the remainder of the culmen is straight or even slightly recurved in the Yellow-billed Loon, rather than strongly decurved. However, an occasional adult *adamsii* exhibits a culmen that is slightly decurved throughout its length, and a few *immer* have nearly straight culmens. (4) In *adamsii* the upper mandibular tomium (cutting edge) usually is straight or faintly recurved from the center of the nostrils to within 5-13 mm of the tip (this distal area slightly decurved); rarely it is slightly decurved from nostril to tip. In *immer* the entire upper mandibular tomium from nostril to tip is moderately decurved. (5) The remainder of the upper mandibular tomium of *adamsii,* from the center of the nostrils to the base, usually is strongly recurved owing to a downward growth of this structure. The effect is to produce a "smile," which sometimes is very noticeable in the field. This portion of the tomium in *immer* is only slightly recurved—not enough to pro-

duce a "smile." (6) In the Yellow-billed Loon the lower outline of each mandibular ramus from the gonydeal angle (herein defined as the ventralmost point on the gonys as viewed from the side) to within about 10 mm of the base is always rather strongly recurved; in the Common Loon, this line (to the extreme base) usually is slightly decurved. We have seen only one specimen of *immer* in which this line was very slightly recurved. (7) The gonydeal angle is more often pointed, less often rounded, in the Yellow-billed Loon. The great amount of overlap, how-

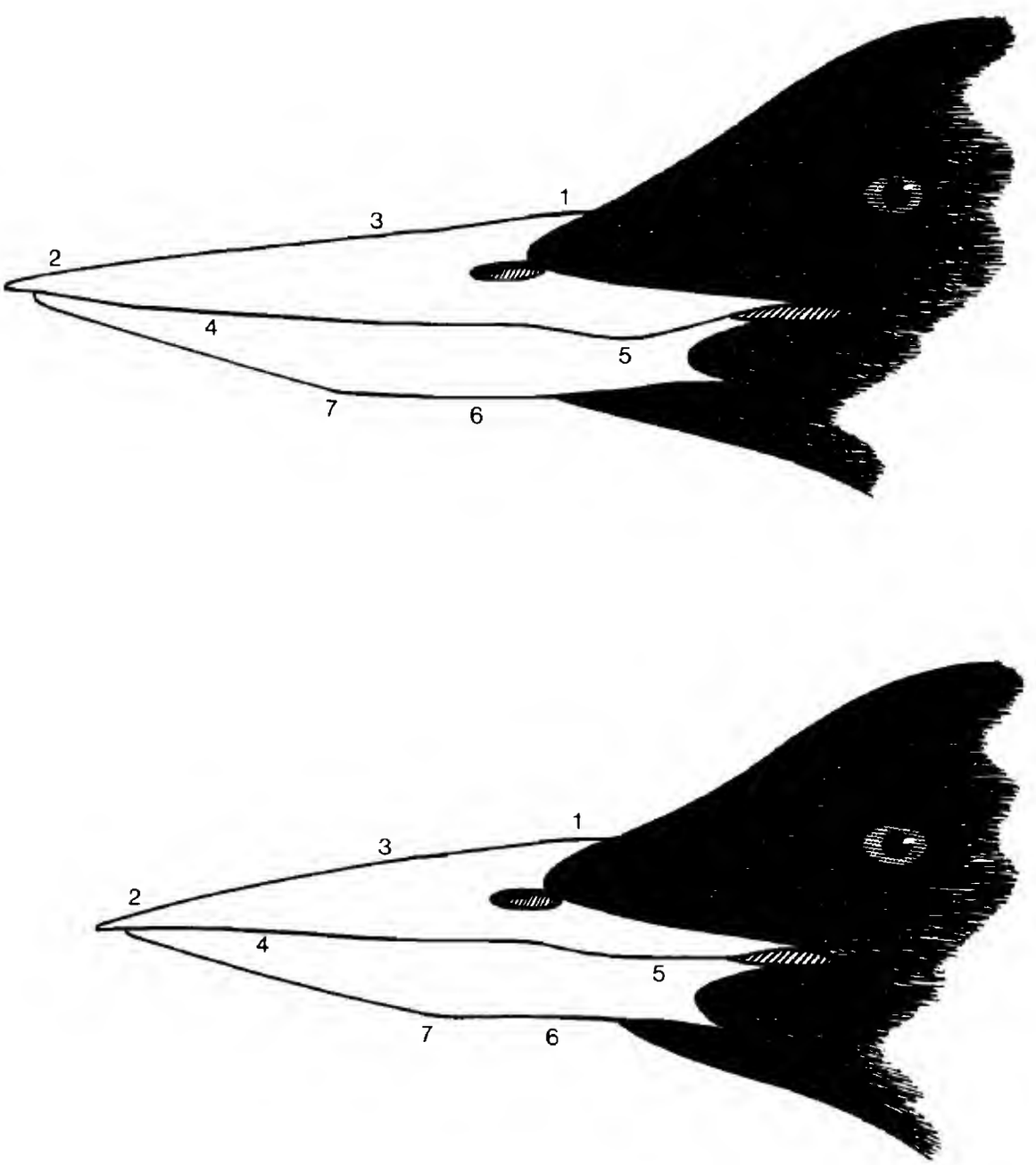

Figure 3. Typical bill shape of adult Yellow-billed (above) and Common loons. Numbers refer to distinguishing characteristics discussed in text. Note also smaller eye and greater anterior extension of chin feathering in Yellow-billed Loon (see text). Bill color not shown.

Drawing by Ken Carlson

ever, makes this difference nearly useless in the field or hand (see discussion of the gonydeal protuberance in juvenal birds).

The literature stresses the "uptilted" bill of adult *adamsii*. Our measurements (Table 1) of the degree of angularity between the gonys (ridge of lower mandible from tip to point of fusion of mandibular rami) and mandibular rami at the gonydeal angle show that *adamsii* averages only 0.5 degrees greater than *immer* . More importantly, 90 percent of the *immer* specimens fall within the range of *adamsii*, and 100 percent of *adamsii* are within the range of *immer*. Thus as an absolute character, the amount of upturn is of no use in either the field or hand.

Nevertheless, the bill of *adamsii* usually seems to be more upturned, an effect that we believe is largely an optical illusion resulting from the eye of the observer inadvertently comparing the degree of angularity with head posture, chin feathering, and the shapes of the culmen and upper mandibular tomium. The angularity will seem greater if, as in *adamsii*, 1) the culmen is straight or recurved (rather than decurved); 2) the upper mandibular tomium is more recurved; 3) the bill is pointed above the horizontal, and the eye of the observer stresses the slant of the gonys only in relation to the horizon; and 4) the chin feathering extends farther anteriorly, producing an "underslung" effect that makes the gonys seem relatively longer and the gonydeal angle closer to the head. The shape of the culmen probably is the most important factor in producing this illusion.

Bill shape: young birds. The bills of young *adamsii* and *immer* develop slowly. At what age full size and shape are attained is uncertain; Godfrey (1962) indicates the first summer. In any event bill shape in juvenal (first fall and early winter) *adamsii* differs significantly from that of adults. In some important characteristics, the bill resembles that of *immer*; the culmen is evenly and rather strongly decurved throughout its length (Figure 1; see also photograph in Jehl 1970); and the upper mandibular tomium is moderately decurved from tip to nostril and only slightly recurved from nostril to base. The curvature of the lower outline of the mandibular ramus is as in adults. We have not measured the degree of angularity of immature bills but presume that age for age it would parallel adults and thus be of no use in identification.

Table 1. Angularity (in degrees) between gonys and mandibular rami in adult *Gavia immer* and *G. adamsii*.

SPECIES	MEAN ANGLE	RANGE	% N WITHIN RANGE OF OTHER SPECIES	N
immer	190.7	187.6-192.5	90	10
adamsii	191.2	189.2-192.5	100	10

Juvenal *adamsii* are said to be distinctive in possessing a slight protuberance at the gonydeal angle (Godfrey 1966). Our inspection, however, indicates that this bump is lacking in some Yellow-billed Loons and well developed in some Common Loons. On the average more individuals of *adamsii* than *immer* have this structure so that when it can be seen in the field, its presence suggests *adamsii*.

In some young *adamsii* (e.g. CAS 65864), perhaps in all at some stage of development, a narrow but rather lengthy gap appears between the middle portions of the mandibles so that in both the hand and field it is possible to look entirely "through" the closed bill. This peculiarity may be a result of the lengthening and straightening of the culmen outstripping the downward growth of the upper mandibular tomia. Because we have never observed this condition in specimens or live examples of *immer*, we suspect that when present it is diagnostic for the identification of *adamsii*.

Size: general. Within each species males average larger than females in most dimensions (see Godfrey 1962 and Tables). Sex for sex and age for age, Yellow-billed Loons average larger than Commons in all linear measurements with which we have dealt except eye size. Extensive variation in most dimensions, especially among Commons, however, produces considerable overlap between the species; this factor and the impossibility of sexing and difficulties of aging birds of either species in the field greatly diminish the value of size as a field mark.

Nevertheless field experience has demonstrated that in certain dimensions *adamsii* does usually appear larger than *immer*; the body seems slightly bulkier, the bill more massive, the neck thicker and the chin feathering more extensive. The first three differences probably are enhanced by an optical illusion resulting from the paler color of the bill and plumage of *adamsii* when viewed against dark water.

Body bulk. *Adamsii* often appears larger than *immer* in body bulk. Unfortunately our only means for estimating bulk is through correlation with wing (chord) and tarsus lengths, both of which may well vary independently of body size. Those of *adamsii* do average longer (Godfrey 1962), but the differences between means are not statistically significant ($P>0.05$; t-test). Until data on body weight, volume or length become available, we must rely on our field observations. Almost certainly, interspecific overlap, coupled with the difficulties of aging, would allow for the separation of only the largest (adult) *adamsii* and smallest (juvenal) *immer*.

Bill size. Bill size, although exhibiting considerable interspecific overlap and requiring subjective appraisals in the field, is a fairly useful field character for distinguishing extremely large (adult) *adamsii* and very small (juvenal) *immer*. The adult bill is more massive in *adamsii* than in *immer*, averaging 9.7 mm (12.0 percent) longer in exposed culmen

length (Godfrey 1962) and 3.0 (13.8) higher at the anterior edge of the nostril (Table 2). In bill height, 50.0 percent of *adamsii* specimens (all ages) exceed all *immer*, and 37.8 percent of all *immer* are under all *adamsii*. The former percentage, however, probably would be much lower if our sample size were larger. We presume that analysis of culmen length would show similar percentage differences. Further analysis of bill size probably would demonstrate that, age for age, young *adamsii* average larger than young *immer* (indicated but not proven in Table 2), but any differences would be useless in the field in the absence of convenient methods for aging. In the hand, where aging is possible, bill size is more useful.

Neck thickness. The Yellow-billed Loon has a disproportionately thick neck, which is noticeable in the field without direct comparison to *immer* because it causes the body and especially the head to appear relatively smaller (which in turn accentuates the size of the bill). The slenderer neck of the Common Loon makes its head appear proportionately large ("round-headed"). When *adamsii* feeds actively, its neck is extended and feathers depressed, so that the greater diameter may not be apparent.

The thicker neck is the result of longer feathers, as demonstrated by measurements (Table 3) of individual feather lengths taken on the side and rear of the midneck (just anterior to the necklace in adults). *Adamsii* exceeds *immer* by an average of 3.8 mm (15.3 percent) on the side and 6.1 (22.0) on the rear in adults, and 3.5 (19.0) and 4.7 (23.9) in young birds. Age for age there is no overlap between the species in

Table 2. Bill height (mm) in *Gavia immer* and *G. adamsii*.

SPECIES	AGE, SEX	MEAN	RANGE	% N OUTSIDE RANGE OF OTHER SPECIES	N
immer	ad. M	22.5*	20.9-24.7		9
	ad. F	21.1*	19.4-23.7		10
	imm. F	19.7	17.6-24.0		8
	All	20.9*	16.3-24.7	37.8	37**
adamsii	ad. F	26.0*	25.5-26.6		3
	ad. F	24.4*	21.9-28.2		9
	imm. F	21.6	20.6-22.8		3
	All	24.4*	20.6-28.2	50.0	18***

*Difference between means in corresponding age, sex class for other species statistically significant ($P<0.05$; t-test).

**Sample includes 10 immature males. There were no immature male *adamsii* available for comparison.

***Sample includes 3 unsexed adults.

Table 3. Neck feather length (mm) in *Gavia immer* and *G. adamsii*.

SPECIES	AGE	MEAN		RANGE		N
		Side	Rear	Side	Rear	
immer	ad.	24.9*	27.7*	23.1-27.6	25.5-30.2	10
	imm.	18.4*	19.7*	16.8-20.8	17.7-21.2	10
adamsii	ad.	28.7*	33.8*	25.3-31.3	31.2-35.9	10
	imm.	21.9*	24.4*	20.9-23.0	22.5-27.2	4

*Difference between means in corresponding age class for other species statistically significant ($P<0.05$; t-test).

measurements of the hindneck feathers. Aging in the field is not necessary because neck thickness is proportional to head and body size and thus may be used without direct comparison to the other species. No sexual differences could be found. The longer feathers, as well as the smaller eye (see below) and proportionately shorter wing and tarsus, perhaps have some adaptive significance related to the environmental conditions in the more northern range of this species.

Chin feathering. In *adamsii* the chin feathers of birds of all ages and plumages extend farther anteriorly, reaching a point below the posterior edge of the nostrils and averaging 19.7 mm from the anterior edge of the malar feathering (on the sides of the mandibular rami). In *immer* the chin feathers end about halfway to the nostrils and only 12.0 mm on the average from the malar feathering. These measurements (Table 4) show almost no overlap; *adamsii* averages 7.7 mm (64.2 percent)

Table 4. Chin feathering extent (mm) in *Gavia immer* and *G. adamsii*.

SPECIES	AGE, SEX	MEAN	RANGE	% N OUTSIDE RANGE OF OTHER SPECIES	N
immer	ad. M	12.4*	9.7-16.9		9
	ad. F	11.6*	8.9-15.5		10
	imm. F	11.5*	9.7-12.6		9
	All	12.0*	8.2-16.9	97.0	38**
adamsii	ad. M	22.6*	19.3-25.0		5
	ad. F	18.6*	16.8-20.3		9
	imm. F	19.7*	18.9-20.2		3
	All	19.7*	16.7-25.0	90.0	20***

*Difference between means in corresponding age, sex class for other species statistically significant ($P<0.05$; t-test).

**Sample includes 10 immature males. There were no immature male *adamsii* available for comparison.

***Sample includes 3 unsexed adults.

greater than *immer*. This "jutting" of the chin adds appreciably to the uptilted appearance of the bill.

Eye size. One of the most interesting aspects of this study was the discovery that the eyes of the Yellow-billed Loon apparently average smaller than those of the Common Loon: for adults, 1.6 mm (12.9 percent) less in length and 1.3 (17.3) in height; and for immatures, 0.9 (7.8) less in length and 1.6 (23.5) in height (Table 5). Relative to other dimensions, the disparity is even greater. Even in the field Yellow-billed Loons appear smaller-eyed (compare Figures 1 and 2). Eye measurements were taken from the left eye of study skins. To minimize the great error resulting from diversity in preparation, we excluded those eyes that exhibited extreme stretching or shriveling. Careful measurements of living or freshly killed birds are needed to confirm our findings. Inclusion of some poorly prepared eyes in our sample serves to increase the range of variation (at both ends); thus the interspecific overlap shown in Table 5 may well be reduced when better measurements become available.

Posture. Each of us, as well as A. Baldridge, D. DeSante and T. Schulenberg (in field notes), has independently noted that the Yellow-billed Loon usually, but not always, carries its entire head and bill in an uptilted position (bill above the horizontal), much in the manner of a Red-throated Loon (*Gavia stellata*). None of us has ever seen a Common or Arctic (*G. arctica*) loon engage in this behavior. Such posturing greatly accentuates the uptilted appearance of the bill.

Head shape. In the field both species occasionally exhibit a flat or even "double-crested" crown. Because the percentage of occurrence of these features seems higher in *adamsii*, they may be used as additional minor aids in identification (W. C. Weber pers. comm.).

Table 5. Eye size (mm) in *Gavia immer* and *G. adamsii*.

SPECIES	AGE	MEAN		RANGE		% N OUTSIDE RANGE OF OTHER SPECIES		N
		Length	Height	Length	Height	Length	Height	
immer	ad.	12.4*	7.5*	9.2-14.7	5.3-10.0			16
	imm.	11.5*	6.8*	9.7-13.4	5.4-9.8			17
	All	11.9*	7.2*	9.2-14.7	5.3-10.0	3	39	33
adamsii	ad.	10.8*	6.2*	9.7-12.4	4.2-7.5			15
	imm.	10.6*	5.2*	10.0-11.5	4.7-6.0			3
	All	10.8*	6.2*	9.7-12.4	4.2-7.5	0	28	18

*Difference between means in corresponding age class for other species statistically significant ($P<0.05$; t-test).

PLUMAGE COLOR IN BREEDING ADULTS

The breeding plumage of the Yellow-billed Loon differs significantly in a number of respects from that of the Common Loon (Godfrey 1962). In *adamsii* the individual white lines that make up the large necklace (midneck patch) are fewer in number (less than 12 vs. more than 12) and broader, their width exceeding that of the alternating black lines rather than being about equal. Similarly the small patch on the upper foreneck is composed of fewer (usually 4-8, rather than 6-10) and broader white stripes; we find that it seems always to be divided midventrally in *adamsii* but only rarely in *immer.*

The differences in the remainder of the head and neck plumage have to do with the color of gloss. In *adamsii* the chin, throat (herein defined as the gular region only), foreneck (jugulum) and sides of the neck posterior to the necklace are all blackish, rather strongly glossed with bluish purple. These areas in *immer* are blackish, rather strongly glossed with green. In addition the hindneck posterior to the necklace is glossed with greenish in *adamsii* and purplish in *immer*—the reverse of what might be expected. Both species have the remainder of the head and neck faintly to moderately glossed with greenish, dullest on the sides of the head. These differences in gloss probably are undetectable in the field except under the most ideal conditions of distance and lighting.

The Yellow-billed Loon has fewer and larger white spots on the back, scapulars, wing coverts, sides, flanks and lower rump; the largest of the scapular spots, for instance, are about 18 mm in length as compared to about 10 mm in *immer.* In *adamsii* the white spots are absent on the longer upper tail coverts and absent or much reduced in number on the upper rump. Finally, the white streaks on the sides of the chest average somewhat broader in *adamsii.* Godfrey (1962) states that the eye of *adamsii* is reddish brown, while that of *immer* is brownish ruby; the legs and feet are dark grayish brown on the outer side and pale grayish flesh on the inner side and webs (latter tinged pink), rather than black on the outer side, medium gray on the inner side, and with flesh-centered dark webs. Variability in these colors has not been studied adequately to assess their value in identification.

PLUMAGE COLOR IN GRAY-BROWN BIRDS

The term "gray-brown birds" is used in preference to "immature and winter adults" because birds in their third summer (Alternate II plumage) are technically immature in that they have not attained *full* breeding plumage.

Head and neck. Aside from characters of the bill, the color and pattern of the head and neck provide the best field marks for identifying gray-brown birds. The malar region, chin, throat and foreneck of both species are whitish, except that on the foreneck most individuals of *im-*

mer have dusky flecking across the anteriormost part and a much darker, more solid, and wider "projection" (which is somewhat indented ventromedially) onto the posterior portions. The flecking and projection are simply extensions of the dark color of the sides of the neck; the former corresponds to the white foreneck patch of breeding adults and the latter to the black neck posterior to the necklace. In *adamsii* both the flecking and projection usually are much paler; the former may be absent; and the latter is darkest along its posterior edge.

The forehead, crown, occiput (hindhead) and hindneck are dark brown in both species. In *immer*, except for a white triangle extending dorsally from the foreneck and corresponding to the white necklace of breeding adults, the sides of the neck and the posterior portions of the auricular region are also dark brown; they merge imperceptibly with the occiput and hindneck and are more or less sharply defined from the white of the malar region and foreneck. In *adamsii* the neck sides and posterior auricular region are much paler—whitish, finely and sparsely flecked with tan—and thus form a broad blending between the white underparts and dark upper parts. Because these lateral areas are pale, the dark strip composing the occiput and hindneck appears in side view to be much narrower than in *immer*.

The temporal, loral and superciliary regions of *immer*, although much paler than the neck sides, are uniformly moderately dark except for a much darker postocular area (connected to the crown) and, in some birds, a dark loral mark connecting the eye to the forehead. *Adamsii* has a paler face and usually lacks the loral mark and sometimes the postocular connection to the crown; thus the whitish of the face usually extends to above the eye, at least anteriorly.

Aside from the color of the culmen, the best field character for separating gray-brown birds is the presence in the Yellow-billed Loon (and absence in the Common) of a discrete, dark auricular (ear) patch—a roundish or irregularly triangular patch of dark brown feathers, approximately 0.5 inch in diameter, centering about one inch behind and slightly ventral to the eye and directly over the ear opening. This patch is encompassed on three sides by the much paler feathering of the temporal, malar, and posterior auricular regions. A "bridge," occasionally as dark and wide as the patch but usually paler and narrower, connects the patch to the occiput. In some individuals the lower edge of the patch may taper downward to a point. In the field the patch is clearly visible, often at extreme distance. In *immer* the auricular region is also dark but merges dorsally *and posteriorly* with the dark of the occiput and thus does not form a well-defined patch.

Mantle. Juvenal loons of the two species are similar; the feathers of the back and scapulars are dark brown with pale gray margins and are small and narrowly rounded, the color and shape together giving

the mantle a marbled appearance. Adults and older immatures (at least in winter) have broader and more squarely tipped (less rounded) feathers, especially in the scapular region. In *adamsii*, however, these feathers are even broader and squarer than in *immer*. This shape difference, together with the much paler and wider gray tips (subterminal or marginal) give the mantle of *adamsii* a cross-banded effect; the margins form discrete parallel rows, each extending from one side of the bird to the other, which are readily apparent in the field. In the Common Loon these feathers are narrower, more rounded, and have darker and narrower gray tips, the whole producing more of a scalloped, less of a cross-banded, effect. Examination of additional museum skins is needed to assess age and plumage variation in this character and to clarify its usefulness in the field.

IDENTIFICATION IN THE HAND

Most field characters may be applied to birds in the hand, and some, such as dimensions and bill shape, take on added usefulness. In most study skins the pale distal half of the culmen of *adamsii* darkens only slightly and remains diagnostic; however, in some specimens (e.g. SDNHM 36831) the entire bill may turn blackish. As noted previously, a pale streak, probably representing a post-mortem change, may be present on a portion of the otherwise black culmen in the Common Loon. Portions of the head pattern of gray-brown birds, especially the auricular patch and whitish areas around the eyes, sometimes are obscured in skins. The patch may be mistaken for a dirty smudge; often it is more easily detected when the skin is viewed from a distance.

A character that is excellent in separating skins of the two species is the color of the shafts of the seven (or more) outer primaries (mentioned briefly by Godfrey 1962). Ventrally, the width of each shaft is divided into three stripes. In *immer* the central portion is tanish white and the sides are fuscous. In *adamsii* the center stripe is always creamy white and the lateral stripes vary from creamy white to pale tan. Dorsally there is much closer approach. Each shaft of *immer* is black at the tip, gradually merging toward the base into yellowish brown medially and medium brown to fuscous laterally; the three stripes may not be apparent, in which case only the extreme basal half inch is pale brown or yellowish. In *adamsii* the tip is dark brown to black; the remainder has a creamy white to yellowish brown center and dark brown to fuscous edges. Although we have seen no overlap, the close approach, especially dorsally but also ventrally, between some examples of the two species necessitates direct comparison of specimens. In at least extreme examples of *adamsii* the paler shafts are visible in the field under ideal conditions of distance and lighting when the floating bird flaps

its wings, and even (rarely) in the resting bird.

We agree with Godfrey (1966) that in first autumn and winter birds the lesser wing coverts of *adamsii* are "more conspicuously margined with grey." The margins average slightly wider and considerably paler—grayish white rather than medium gray. These feathers are concealed by the scapulars in the live resting bird; and in any event the differences probably would not be discernible in the field.

SUMMARY

The following summary lists those characters present in the Yellow-billed Loon that are more or less useful in separating it from the Common Loon. The reader is cautioned to study the more detailed descriptions in the text before attempting to apply these features.

Birds of any age and plumage: at least distal half of culmen always pale; body usually somewhat bulkier; neck thicker (due to longer feathers), making head appear proportionately small; chin feathering extends farther anteriorly, to a point below posterior edge of nostril; eye appears and probably measures (averages) smaller; bill often held above horizontal; crown more often flat or double-crested; lower outline of each mandibular ramus rather strongly recurved from gonydeal angle to within 10 mm of base; primary shafts paler (most useful in hand).

Adults in any plumage: bill averages longer and higher; swelling at base of culmen frequently slightly more pronounced; basal half or more of culmen usually straight or slightly recurved, the remainder usually only faintly decurved; upper mandibular tomium from nostril to near tip usually straight or slightly recurved, the basal remainder usually strongly recurved to produce a "smile"; gonydeal angle more often pointed.

Adults in breeding plumage: necklace and patch on upper foreneck with broader and fewer white lines; necklace apparently always divided midventrally; ventral portions of head and neck glossed with bluish purple; posterior hindneck glossed with greenish; white spots fewer and larger on mantle, reduced in number or absent on upper rump, and absent from longer upper tail coverts; white streaks on side of chest average wider; apparently, legs and feet paler and eye browner.

Gray-brown immatures and adults: throat flecking and foreneck projection much paler, the former sometimes absent, the latter darkest posteriorly; posterior auricular region and sides of neck much paler, blending with white underparts and (side view) reducing dark of occiput and hindneck to narrow strip; whitish of remainder of face paler and usually encircling at least anterior part of eye; discrete auricular patch present;

mantle of adults and winter immatures beyond juvenal stage strongly cross-banded.

Immatures: presumably, age for age, bill larger; gap between mandibles sometimes present; a few more juvenal individuals have protuberance at gonydeal angle; lesser wing coverts of juvenal birds more conspicuously margined with gray (hand only).

For *adamsii* in gray-brown plumage the best field marks are the paleness of the distal half of the culmen and the presence of an auricular patch; the best in-hand characters are the extent of chin feathering and the color of the primaries and culmen. The bill develops slowly and in many respects, including size and culmen shape, is similar to that of the Common Loon into at least the first summer. The degree of angularity between the mandibular rami and gonys in adults (and presumably young) is of no use in the field or hand. Bill gap and eye size require further testing before they can be treated as confirmed identification marks.

NOTE

As this manuscript neared completion an excellent and comprehensive article on identification of *G. adamsii* appeared in *British Birds* (Burn and Mather 1974). So that the reader will realize that we arrived at many of the same conclusions independently, using entirely different data, we have in no way modified the foregoing discussion.

Burn and Mather discuss three useful in-hand characters not treated herein but with which, upon further inspection, we concur (with certain reservations). These features hold for young birds but to a lesser, more variable degree than in adults. (1) In cross section (as viewed from the front), both mandibles of *adamsii* average more flat-sided, less swollen or convex, especially anterior to the nostrils. (2) The feathering at the base of the upper mandible in *adamsii* "always" extends several millimeters beyond the nasal turbercle, but in *immer* stops at or before the anterior edge of the tubercle. However, we have examined two specimens of *immer* (MVZ 60231 and 144199) in which the feathering clearly extends 1 mm beyond the tubercle. (3) In *adamsii* the mandibular rami fuse completely and evenly to form the gonys; this is true in some *immer* specimens, but most have a groove, more or less developed, continuing for a variable distance beyond the posterior edge of the gonys. We find this character difficult to use.

Measurements given by Burn and Mather confirm our supposition that, age for age, bill size distinctions between young of the two species vary in much the same manner as in adults. These authors do not discuss the auricular patch, eye size, neck thickness, bill gap, or certain features of the adult bill. Neither do they fully differentiate between nor elucidate the problems involved with the gonydeal angle and the degree of angularity between the gonys and mandibular rami. Unlike Burn and Mather, we use the terms "immature" and "young" to mean any bird from the time of acquisition of juvenal plumage through the second summer (Alternate II plumage; bird two years old); the term "juvenal" is restricted to birds in their first fall and early winter.

ACKNOWLEDGMENTS

We wish to thank Ned K. Johnson and Betsy Webb for use of specimens in their care, David L. Pearson and Terence R. Wahl for loan of photographs, and W. Earl Godfrey and Robert W. Storer for helpful comments. Arnold Small supplied his excellent photographs for Figures 1 and 2, and Ken Carlson prepared Figure 3. Will Russell and Richard Stallcup kindly provided notes in their possession. The detailed field notes of the following people were extremely helpful: Alan Baldridge, Bruce Broadbooks, David DeSante, Richard Erickson, Ronald LeValley, Clarence B. Maynard, R. Guy McCaskie, Peter Metropulos, Tom Schulenberg and G. Shumway Suffel. Wayne C. Weber kindly reviewed the manuscript.

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BREEDING OF GREAT BLUE HERONS AND GREAT EGRETS AT AUDUBON CANYON RANCH, CALIFORNIA, 1972-1973

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Great Blue Herons (*Ardea herodias*) and Great Egrets (*Casmerodius albus*) are among the species known to have suffered eggshell thinning as a result of accumulating high levels of DDT and its derivatives in their body tissues (Vermeer and Reynolds 1970, Henny and Bethers 1971, Faber et al. 1972). Great Egret reproductive success in the San Francisco Bay region was recently diminished because eggs broke during incubation (Pratt 1972a) while the effect of eggshell thinning on reproductive success of Great Blue Herons was insignificant.

In 1972 the Environmental Protection Agency imposed an almost total ban on use of DDT, but even before this there were local restrictions on its use. The study reported on here has continued without interruption since 1967, allowing a comparison of reproductive success in these two affected species before and after restrictions on use of DDT.

This paper presents observations on nesting success, population levels, laying dates and clutch size of Great Blue Herons and Great Egrets during the 1972 and 1973 nesting seasons at Audubon Canyon Ranch near Stinson Beach, Marin County, California. I reported results for the earlier years elsewhere (Pratt 1970, 1972a, 1972b). Relevant data from the first five years of the study are included here for comparison. Nesting success of Great Blue Herons has been reported for Canada (Vermeer 1969, McAloney 1973) and for Oregon (Henny and Bethers 1971). Teal (1965) reported on nesting success of Great Egrets in Georgia.

The study area and methods are unchanged since my earlier descriptions (Pratt 1970, 1972a) and for the sake of brevity I shall not repeat them here. Readers may consult the publications referred to for details.

RESULTS AND DISCUSSION

Great Blue Heron

Table 1 summarizes Great Blue Heron breeding success for the seven years. In 1972 the number of young fledged per breeding pair increased to 1.7 from the low of 1.3 in the previous year. The percent of successful nesting attempts increased and the proportion of attempts that lost all the eggs dropped to 14% from the high of 27% in 1971. The number fledged per successful nest increased from 2.0 in 1971 to 2.2.

Table 1. Results of Great Blue Heron nesting at Audubon Canyon Ranch, California, from 1967 through 1973. 1. Successful attempts fledged at least one young bird. 2. Attempts losing eggs lost all eggs before any hatched. 3. Attempts losing nestlings lost all nestlings. 4. Hatching failures were clutches incubated 5 weeks or more without hatching. 5. Laying failures were pairs that built and occupied nests 2 weeks or more but never laid eggs; this category was not included in the analysis in 1967 and 1968.

	1967	1968	1969	1970	1971	1972	1973
Estimate of breeding pairs	50	62	55	50	44	46	58
Number fledged/breeding pair	1.5	1.7	2.0	1.5	1.3	1.7	1.5
Number of nesting attempts	61	69	55	58	56	50	67
% attempts successful[1]	56	74	87	66	54	72	63
% attempts losing eggs[2]	11	9	4	17	27	14	15
% attempts losing nestlings[3]	31	13	5	14	9	6	15
% hatching failures[4]	2	4	4	3	5	2	7
% laying failures[5]	—	—	0	0	5	2	0
% unknown failures	0	0	0	0	2	2	0
Number of successful attempts	34	50	48	38	30	36	42
% successful nests fledging one	24	14	14	29	23	14	21
% successful nests fledging two	50	64	42	47	60	56	52
% successful nests fledging three	26	22	42	24	13	28	26
% successful nests fledging four	0	0	2	0	3	2	0
Number fledged/successful nest	2.2	2.1	2.3	1.9	2.0	2.2	2.0

Egg loss remained at the same level in 1973, but the average number of fledglings per breeding pair declined to 1.5 and the number fledged per successful nest declined to 2.0. Successful nesting attempts were 9% fewer largely because of an increase in the proportion of attempts that lost nestlings. The fact that in four nests all chicks in the brood died at about the same time although the adults were still in attendance suggests that an increase in disease or massive parasitic infestation may have contributed to the increased nestling loss. Hatching failures reached a seven-year high of 7% in 1973 but this factor remained relatively unimportant to overall nesting success.

The estimated number of breeding pairs at Audubon Canyon Ranch ranged between a high of 62 in 1968 and a low of 44 in 1971. There were 46 pairs in 1972 and in 1973 the population increased to 58 pairs. Clearly the level of the breeding population did not fluctuate in parallel with nesting success. Since herons probably begin to breed when they are two years old (Bent 1926) and 1969 was the most successful year for the herons, if there were a direct relationship between nesting success and the subsequent number of breeding pairs one would expect an increase in the population in 1971. Instead, a drop to 44 pairs occurred. Nor can the increase in breeding pairs in 1973 be explained as the re-

sult of a prior highly successful year. Nesting success was unusually low in 1971, the year that would be expected to contribute new breeding adults in 1973. A similar lack of correspondence between breeding success and the subsequent number of breeding pairs has been found for other species, notably the White Stork (*Ciconia ciconia*) (Lack 1966: 227-228). Barring extreme nesting failures, mortality during migration and on the wintering grounds may affect the size of the breeding population in any given year to a greater extent than previous reproductive success.

Heron movements may also affect the size of breeding colonies. Lack (1954) suggests that some switching of individual pairs of herons occurs between colonies from year to year. Heronries may also be deserted or move (Lowe 1954, Carriger and Pemberton 1908, Fahey 1968, Mehner 1952, Vermeer 1969). In a statewide survey of heronries conducted from 1969-1971 by the California State Department of Fish and Game, only 32 of the 109 active heronries reported in 1971 had a history of nesting activity over the three years of the study (Mallette 1972). Three of the heronries active in 1971 were reported as inactive in 1969 or 1970.

Not far from Audubon Canyon Ranch were two small active heronries in 1973, one about 38 km northwest on the shore of Schooner Bay and another about 40 km north near Marshall on Tomales Bay. During the last 10 years, Great Blue Herons established colonies at these heronries that grew from 1 or 2 nests to 10 or 15 in 1972 and 1973. The decline in breeding pairs at Audubon Canyon Ranch from 1968 to 1973 may have been balanced by growth at these colonies. At another heronry about 18 km north near the Point Reyes National Seashore headquarters at Olema, there were between 19 and 24 nests occupied by Great Blue Herons in 1972 (R. M. Brown pers. comm.) but no herons returned in 1973. At still another site on the shore of Tomales Bay about 3 km north of the Olema heronry, local residents report between 5 and 10 active heron nests in 1972. A large tree that may have held the nests blew down the following winter. There was no trace of old nests or breeding herons in the spring of 1973. The breeding population of herons at Audubon Canyon Ranch may have been increased in 1973 by the addition of herons from these deserted colonies, but since none of the birds was marked this speculation can not be verified.

Great Egret

The most successful year for the Great Egrets was 1972 when they raised 1.5 young per breeding pair (Table 2). Successful nesting attempts reached a high of 63%, nestling loss was low, and the percent of nesting attempts that lost eggs dropped sharply. In 1970 when egg loss was most frequent, many eggs broke in the nest during incubation (Pratt 1972a). Measurements of eggshells confirmed that the egrets were laying thin-shelled eggs (Faber et al. 1972). Although eggshells were not

measured in 1972, the lower percent of attempts that lost eggs suggests that the egrets made considerable recovery from eggshell thinning in that year. Egg loss remained at the same relatively low level in 1973.

In 1973 egret nesting success declined to 1.2 fledglings per breeding pair. Successful nesting attempts dropped to 50% and attempts that lost all nestlings reached a high of 19%. Part of the percentage increase in nestling loss was an indirect result of the decline in egg loss. Since fewer late attempts lost eggs, more young hatched late and were then deserted by the adults in July about the time that chicks from successful nests departed. In addition, more chicks than usual died early in the season in nests where adults remained in attendance. It appeared that the egret chicks were affected by the same mortality factor that caused a rise in heron nestling loss.

The proportion of egret nests able to raise 3 young fell from 19% in 1972 to 9% in 1973. In part this resulted from reduced hatching success in 1973. In a sample of 46 nests with known clutch size in 1972, 83% of the eggs hatched. In a similar sample of 42 nests in 1973, 76% of the eggs hatched. Consequently the number of known broods of 3 or 4 fell from 39 in 1972 to 29 in 1973. Smaller clutches were not responsible for the decline since mean clutch size for the samples in both years was 3.0 (Table 4).

A second factor contributing to the drop in percent of nests raising 3 young in 1973 was the large proportion of broods of 3 that lost all the chicks. Only 2 broods of 3 failed completely in 1972 but 10 failed completely in 1973. Normal losses within broods left only 6 nests in 1973 able to produce 3 young. Since the percent of attempts raising 2 was high in 1973, the average number raised per successful nest of 1.9 was about the same as the 2.0 raised per successful nest in 1972.

The estimate of breeding pairs of egrets increased in 1972 to 96 from the level of about 85 during the preceding 3 years. Movements of Great Egret breeding populations make determination of the status of the population as difficult as it is for the Great Blue Herons. Two examples have recently been reported from central California. At Bair Island in south San Francisco Bay, 75 Great Egret nests were reported in 1967 but none were there in 1969 or 1971 (Gill 1972). At a San Joaquin River heronry in Merced County a Great Egret colony grew from 2 nests in 1966 to 50 in 1970 but in 1971 there were none (Page 1971). It would be unjustified therefore, to assume that the results at Audubon Canyon Ranch are necessarily indicative of general population trends.

Timing of Laying and Clutch Size

In the seasons from 1968-1970 Great Blue Heron clutch initiation proceeded rapidly once it started (Figure 1). Laying dates for 1967 were omitted from the analysis because observations did not commence

Table 2. Results of Great Egret nesting at Audubon Canyon Ranch from 1967 through 1973. For description of categories see Table 1.

	1967	1968	1969	1970	1971	1972	1973
Estimate of breeding pairs	70	74	86	85	85	96	99
Number fledged/breeding pair	1.4	1.1	1.0	1.0	1.1	1.5	1.2
Number of nesting attempts	96	109	120	154	124	114	129
% attempts successful	52	41	33	28	40	63	50
% attempts losing eggs	30	34	39	54	41	23	22
% attempts losing nestlings	8	17	11	10	13	8	19
% hatching failure	9	7	13	3	6	4	8
% laying failure	—	—	4	5	1	0	0
% unknown failure	0	0	0	0	0	2	1
Number of successful attempts	50	41	40	43	49	72	64
% successful nests fledging one	37	32	25	30	33	16	23
% successful nests fledging two	33	61	28	49	45	65	67
% successful nests fledging three	30	7	45	21	20	19	9
% successful nests fledging four	0	0	2	0	2	0	0
Number fledged/successful nest	2.1	1.8	2.3	1.9	1.9	2.0	1.9

Table 3. Frequency of Great Blue Heron clutch sizes at Audubon Canyon Ranch from 1967 through 1973.

	2 EGGS	3 EGGS	4 EGGS	5 EGGS	SAMPLE	MEAN
1967		5	4	1	10	3.6
1968		5	10		15	3.7
1969		6	8		14	3.6
1970		6	8		14	3.6
1971	3	6	3		12	3.0
1972	1	7	4		12	3.3
1973		24	7		31	3.2

Table 4. Frequency of Great Egret clutch sizes at Audubon Canyon Ranch from 1967 through 1973.

	2 EGGS	3 EGGS	4 EGGS	5 EGGS	SAMPLE	MEAN
1967	2	10	5		17	3.2
1968	1	13	3	1	18	3.2
1969	3	19	6	1	29	3.2
1970	2	15	6		23	3.2
1971	6	40	5	2	53	3.1
1972	7	26	9		42	3.0
1973	6	34	6		46	3.0

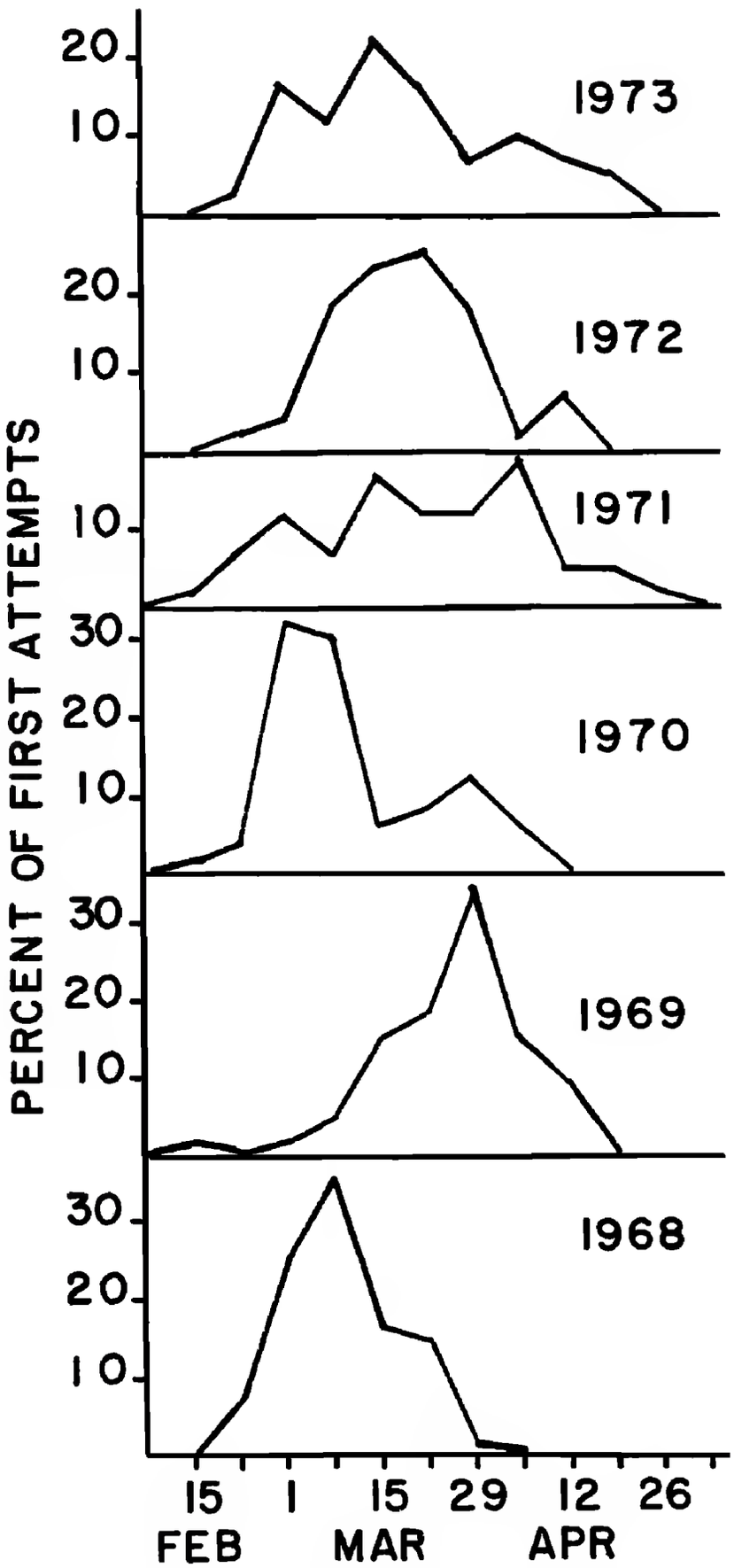

Figure 1. Percent of Great Blue Heron clutches of first nesting attempts started per week, 1968-1973, at Audubon Canyon Ranch.

until 25 March after most clutches had been started. Cold weather in March of 1969 may have delayed laying early in the month (Pratt 1972b) but 34% of the clutches were started in one week in that year and about the same percentage were started in one week in 1968 and 1970. In 1971-1973 clutch initiation was slower. Not more than 25% of the clutches were started in one week and in 1971 the maximum was only 17%. March was relatively cold in 1971 and 1973. Mean temperatures for March taken at the Point Reyes Bird Observatory were 45.9°F in 1971, 47.9° in 1972, and 42.6° in 1973. I previously explained the lag in laying in 1971 as the result of cold weather (Pratt 1972b), but low temperatures alone seem insufficient to explain the very slow rate of clutch initiation in that year since 1973 was even colder and the lag in 1973 was less pronounced.

Ability of females to find enough food to form eggs may also influence the dates of laying (Lack 1966:272-273, Perrins 1970), laying being delayed until the food supply is adequate for egg formation. The slower rates of clutch initiation in 1971-1973 may thus indicate that food was harder to find during laying in those years than in 1968-1970.

The years 1971-1973 were also characterized by smaller Great Blue Heron clutch size (Table 3). The mean of 3.2 for the years 1971-1973 was significantly lower than the mean of 3.6 for 1967-1970 ($p<.01$). The mean of 3.6 is in close agreement with the mean of 3.66 reported by Henny (1972) for Great Blue Herons in central California.

In some species of birds where breeding is delayed past the first year, females breeding for the first time lay later and lay smaller clutches than experienced birds (Coulson and White 1958, Fisher 1969, Richdale 1957, Woolfenden 1973). This could be true for herons also although I know of no studies substantiating it. It seems unlikely, however, that the proportion of females breeding for the first time would increase enough to account for the observed difference in clutch size and laying dates for three consecutive years.

Clutches laid late, independent of the age of females, have been shown to be smaller for the Black-legged Kittiwake (*Rissa tridactyla*) than those laid early (Coulson and White 1961). However heron clutches were not reduced in 1961 when laying was late.

The amount of food available to the female when the eggs are being formed may affect clutch size. When food is hard to find, clutches may be smaller than when it is easily obtained (Lack 1966:6). Thus the reduction in heron clutch size in 1971-1973 coinciding with the lag in laying supports the hypothesis that laying females may have had difficulty finding food early in those seasons.

The number fledged per successful nest did not decline in the years when laying was later and clutch size was smaller (Table 1). Perhaps food became easier to find as the season progressed. In addition, a drop

in clutch size of the magnitude that occurred acting alone would have little effect on fledging success since the most frequent number fledged per successful nest was 2. Almost all the fourth chicks to hatch and many of the third chicks died, presumably of starvation, during the first weeks of their lives.

Mean Great Egret clutch size for 1971-1973 was also smaller than for the first four years (Table 4), although the difference between the mean of 3.0 for 1971-1973 and 3.2 for 1967-1970 was not statistically significant. The egrets start laying about a month after the herons when most heron clutches are complete. Thus if food became easier to find later in the season, egret clutch size might not be affected as much. The preferred prey of the egrets may differ from that of the herons by size or species as well, and its availability would not necessarily fluctuate in parallel with that of the herons.

Egret clutch initiation was not slowed in 1972 and 1973 (Figure 2). Most clutches were started in the week ending 5 April, the same week that laying peaked in 1969 and 1970 (Pratt 1972a). But in 1971 clutch initiation almost ceased between 19 April and 3 May. During this time 16 nests were started and abandoned before any eggs were laid, an unusually large number of nesting attempts to be terminated during building. The weather during these two weeks did not show disturbance

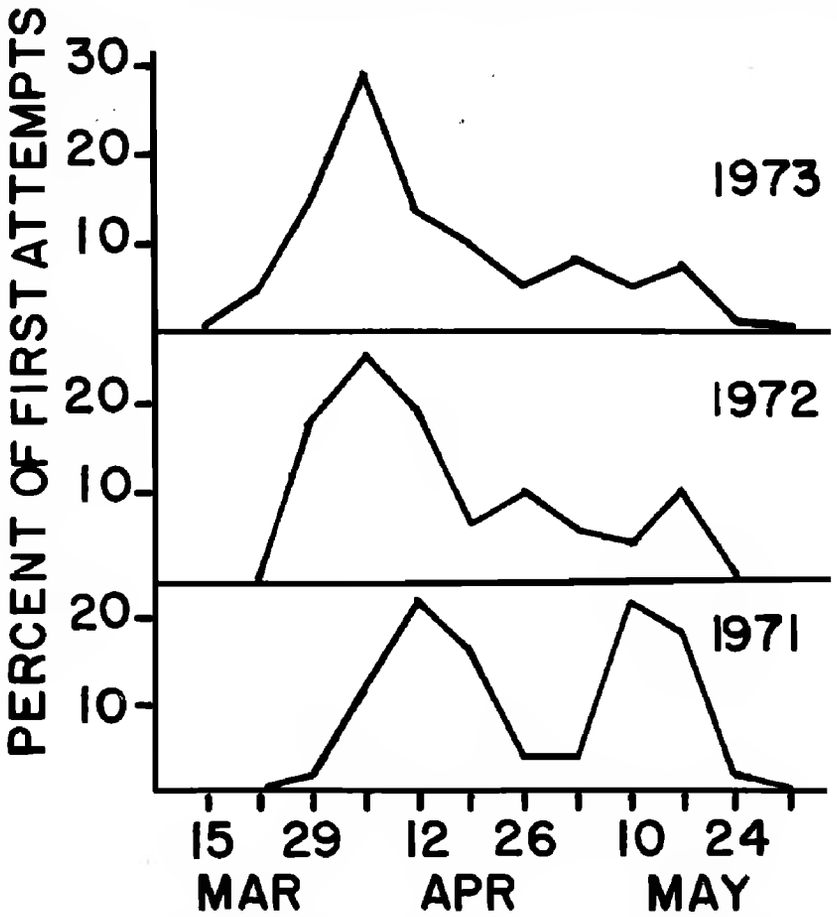

Figure 2. Percent of Great Egret clutches of first nesting attempts started per week, 1971-1973, at Audubon Canyon Ranch.

great enough to account for such a drastic decline in laying. Egret nests containing eggs did not show unusual disruptions at this time. Perhaps laying egrets experienced temporary difficulty in finding food necessary for egg formation but pairs with completed clutches were able to find enough food to sustain them during spells of incubation.

SUMMARY

Great Blue Herons at Audubon Canyon Ranch produced 1.7 young per breeding pair in 1972 and 1.5 in 1973. Egg loss declined in 1972 from the seven year high reached in 1971. Nestling loss was higher in 1973 perhaps because of disease or infestation of parasites. Breeding pairs increased from 46 in 1972 to 58 in 1973 coincident with desertion of two other small heronries within 28 km of Audubon Canyon Ranch.

Great Egret reproductive success increased to 1.5 young per breeding pair in 1972 from about 1.0 in the previous 4 years because of a decline in nesting attempts losing eggs. The decline in egg loss suggested partial recovery from DDT induced eggshell thinning. Egret production declined in 1973 to 1.2 fledglings per breeding pair due to increased nestling loss. The number of breeding pairs of egrets at Audubon Canyon Ranch increased to about 95 in 1972 and 1973 from about 85 in 1971.

Clutch size for the Great Blue Herons was significantly smaller in 1971-1973 than it was in 1967-1970 and laying was later. It is suggested that both occurred because the females may have had difficulty finding food during laying.

ACKNOWLEDGMENTS

I thank Barbara Fearis and Libby Meyers for help in the field. David G. Ainley read an earlier draft of the manuscript and offered constructive suggestions. Gary Page provided the statistical analysis. The study was supported by a grant from Audubon Canyon Ranch. This is Contribution 85 of the Point Reyes Bird Observatory.

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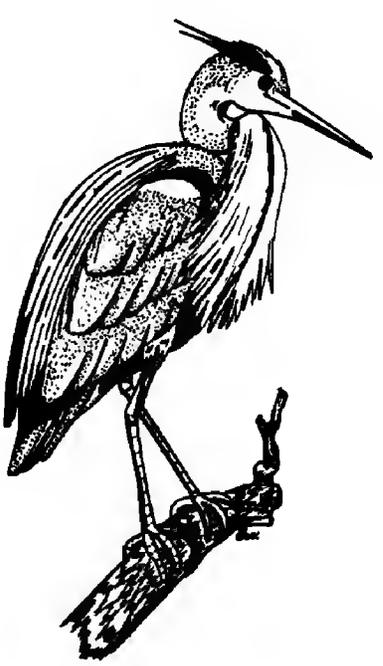

Sketch by Erv Deis

NOTES

FIRST OREGON RECORDS FOR THICK-BILLED MURRE

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Thick-billed Murres (*Uria lomvia*) have been recorded wintering as far south as Vancouver Island, British Columbia (AOU Check-list, 1957) and have been found off the central and southern California coast (see Yadon, Calif. Birds 1:107-110, 1970, for records up to 1970 and DeSante and Remsen, Am. Birds 27:110-119, 656-662, 1973, for more recent records). They have not, however, been reported from either Washington or Oregon.

During the process of cataloging the Overton Dowell Jr. ornithological collection into the Oregon State University collection, a specimen labeled as a Common Murre (*U. aalge*) was identified as *U. lomvia*. The specimen is O.S.U. No. 10,483 and was collected dead on the beach on 30 January 1933 near Mercer, Oregon (Lane Co.) by Overton Dowell Jr. The bird was a male in winter plumage and the following measurements (in mm) were recorded: wing flattened 195, exposed culmen length 27.7, depth of bill at gonydeal angle 10.1, tarsus 39.8, gonydeal angle to tip of bill 14.0 and bill depth at base of culmen 10.1

A second Thick-billed Murre was found dead near the south jetty of the Columbia River (Clatsop Co., Oregon) on 15 September 1972 by Harry B. Nehls. Direct comparison with texts, figures and *U. aalge* indicated that it was an adult bird going from summer to winter plumage. The specimen was badly decomposed so determination of sex was not possible. Unfortunately, only the upper and lower mandible were saved (O.S.U. No. 10,917). Identification of both specimens was confirmed by the staff of the National Museum of Natural History in Washington D.C.

The dates of these specimens fall well within the extremes (27 August-9 April) for previous southern records. These specimens represent the first and second records of *U. lomvia* for Oregon. The lack of additional records is undoubtedly due to the difficulty in distinguishing *U. lomvia* from *U. aalge* as has been previously suggested (Yadon, Calif. Birds 1:107-110, 1970).

BARRED OWL SIGHTINGS IN WASHINGTON

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At approximately 0900 on 24 April 1974 I was conducting Ruffed Grouse (*Bonasa umbellus*) drumming counts near Bacus Hill, approximately 8 km east of Sedro Woolley, Skagit County, Washington. I was startled by an owl that flew past me approximately 50 m away and landed in a Western Red Cedar (*Thuja plicata*). In flight the owl appeared dark brown and when it landed I noticed white spots on its back. It flew before I could see the breast, belly or head.

After ten minutes of searching, I heard owl calls that sounded like the eight-note "who cooks for you, who cooks for you all" call of the Barred Owl (*Strix varia*). I moved in the direction of the calls and saw two owls fly from trees 30 m away. I stalked them until I finally had a good view with 7x35 binoculars of one of the owls perching on the limb of a Black Cottonwood (*Populus trichocarpa*) 50 m away. The medium-sized owl had a puffy round head, large dark eyes, and was barred crosswise on the breast and streaked lengthwise on the belly. I was then confident the owls were Barred Owls.

I heard the owls calling in the same area on 5 May 1974 at 0930 and 8 August 1974 at 2330. At 2000 on 10 August 1974 at a point 0.25 km south of the area where I first observed the owls on 24 April, Terence Wahl, James Duemmel and Norm Lavers called in a pair of Barred Owls by playing a prerecorded tape of the species' calls. The observers all had close views of the owls and the owls' calls were tape-recorded.

I subsequently called the pair into the same point on 19 August 1974 at 1900, 26 August 1974 at 0800 and 1830, and photographed the owls on 26 August. On these dates, the owls frequently answered the tape recordings and, although they often flew out of view, they normally remained in the area from one to two hours. They often answered with laughing, scolding calls that were very different from the "who cooks for you" call. These calls were probably similar to the cackling, laughing and whooping calls described by Brewster (1925) and "a cry that seems to express anger, sounds like ho-ho-to-whah-ow or whah-whah-whah-to-hooo with loud, nasal rasping notes, as derisive laughter" described by Bent (1938:193). On two of these occasions I was able to get directly below the owls when they were roosting in Red Alder (*Alnus rubra*) and cottonwood trees approximately 10 m above me. Although I feel the owls possibly nested in the area, no nests or young were observed. I also heard a Barred Owl calling in the same area on 2 October 1974 at 1730.

This is the first record of a pair of Barred Owls in western Washington. T. R. Wahl (pers. comm.) has furnished information on the following additional records in this part of the state. One was found dead in December 1973 near Skykomish, Snohomish County (B. and P. Evans). One was heard calling on 16 September 1974 at Colonial Creek Campground, Whatcom County (J. Gibson and C. Smith), and a pair was heard and tape-recorded and one bird seen there on 27 September 1974 (T. R. Wahl and Dennis Heinemann). Other records of the owl west of the Cascade Range include one photographed in Victoria, British Columbia on 26 November 1969 "well to the west of any previous record" (Crowell and Nehls 1970:86), and one photographed 13 November 1972 in Vancouver, British Columbia (Crowell and Nehls 1973).

The first state record is of a bird observed 2 October 1965 at Blueslide, Pend Oreille Co. (Rogers 1966). Other eastern Washington records include a specimen found shot 15 October 1968 on Mica Peak, Spokane Co. (Rogers 1969), and a bird photographed and captured at Spokane, Spokane Co., 11 October 1973 (Ro-

gers 1974, photo published). A sighting in July 1973 near Middleport, Stevens Co. by D. R. Paulson (T. R. Wahl pers. comm.) and sightings near Park Rapids, Stevens Co. on 23 June, 30 June and 5 July 1974 (Phil Mattocks pers. comm.) suggest the possibility of breeding in eastern Washington.

Larrison and Sonnenberg (1968:151) describe the Barred Owl as a "rare irregular fall and winter straggler to northeastern Washington" and Wahl and Paulson (1973) describe it as a rare winter resident to eastern Washington. Jewett et al. (1953) do not mention the Barred Owl in the *Birds of Washington* and neither do Gabrielson and Jewett (1940) in the *Birds of Oregon*. These recent sightings in western Washington, particularly during the breeding season, suggest a significant range expansion of the species.

The habitat where I observed the owls is best described as an 80 year old second growth mixed hardwood-conifer forest (J. Leder pers. comm.). The area is on a south-facing, relatively steep slope at an elevation of approximately 210 m. Red Alder and Western Red Cedar are the prominent tree species with Douglas-fir (*Pseudotsuga menziesii*), Western Hemlock (*Tsuga heterophylla*), and Big-leaf Maple (*Acer macrophyllum*) also being present. Alder trees occur predominantly in 30-40 cm diameter size classes; cedar is most abundant in smaller 5-20 cm diameter sizes. There is a moderate shrub and herb cover with Vine Maple (*Acer circinatum*), Red Huckleberry (*Vaccinium parvifolium*), Dewberry (*Rubus ursinus*) and Sword Fern (*Polystichum munitum*) being the most common. The land within 0.7 km of the area is forested. This surrounding area is approximately one-third mixed hardwood-conifer forest, one-third alder forest (alder being dominant with Big-leaf Maple and Red Cedar as subordinates) and one-third coniferous forest (Douglas-fir, Red Cedar and Western Hemlock being dominant). Clear-cut areas occur 0.7 km southwest of the area and pasturelands are 1 km to the southeast.

Because I found no owl pellets, I have no data on the owls' food habits. However, the Deer Mouse (*Peromyscus maniculatus*) is abundant in the area with other possible prey species including the Douglas Squirrel (*Tamiasciuris douglasii*), Northern Flying Squirrel (*Glaucomys sabrinus*), Townsend Chipmunk (*Eutamias townsendii*), Oregon Vole (*Microtus oregonii*), Snowshoe Hare (*Lepus americanus*), Eastern Cottontail (*Sylvilagus floridanus*) and Ruffed Grouse also being present.

ACKNOWLEDGMENTS

I wish to thank Terence Wahl for providing information on records and reviewing the manuscript, and Puget Sound Power and Light Co., Bellevue, Washington, for providing research funds.

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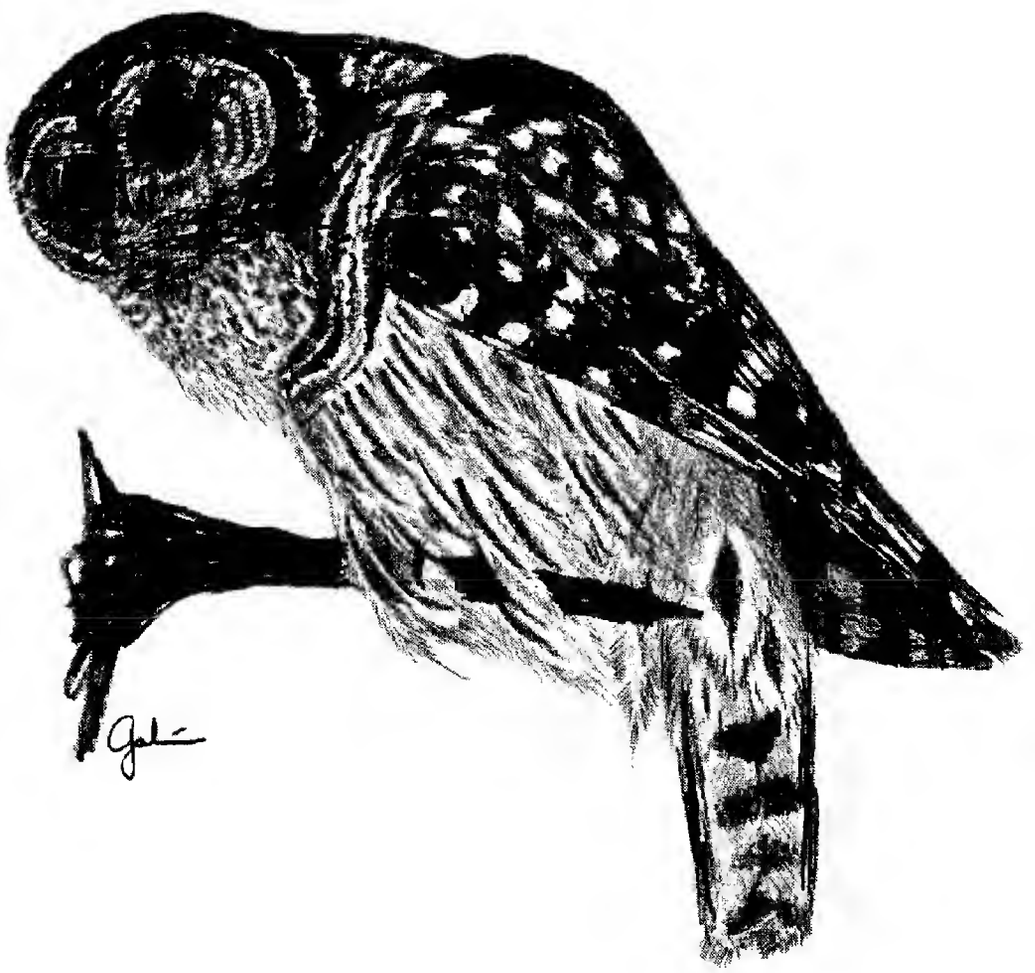

Sketch by A. Galván III

INDEX TO VOLUME 5

Compiled by JEANNE A. CONRY

Accipiter cooperii, 67, 70, 75, 77
Actitis macularia, 67, 70
Ainley, David, see Scott, J. Michael, et al.
Aix sponsa, 67
Aphelocoma coerulescens, 68, 72, 76
Archilochus alexandri, 67
Ardea herodias, 67, 72, 127-136
Asio flammeus, 103, 110
  otus, 67, 70, 103, 109
Auklet, Cassin's, 17
  Rhinoceros, 13-20
Behle, William H. and Michael L. Perry, A record of the Bay-breasted Warbler from Utah, 57
Binford, Laurence C. and J. V. Remsen, Jr., Identification of the Yellow-billed Loon (*Gavia adamsii*), 111-126
Blackbird, Brewer's, 69
  Rusty, 30
Bonasa umbellus, 72, 138, 139
Brant, Atlantic, 91-92
  Black, 91-92
  Intergrade, 91-93
  Lawrence's, 91-92
Branta bernicla, 91-93
  b. hrota, 91-92
  b. nigricans, 91-92
  b. orientalis, 91-92
  nigricans, 91-92
Bubo virginianus, 67, 102, 105
Bunting, Lazuli, 69, 76
Bushtit, 68, 76
Buteo jamaicensis, 67
  lineatus, 67, 70, 75, 77
Butorides virescens, 67,
Calidris alpina, 1-12
  a. pacifica, 5
  mauri, 1, 2, 4, 5, 8
  minutilla, 1, 4, 5, 8
Callipepla squamata, 54
Calypte anna, 67
Caprimulgus vociferus, 46
  v. arizonae, 46
Cardinal, 72
Cardinalis cardinalis, 72
Carpodacus mexicanus, 69, 76
  purpureus, 72
Casmerodius albus, 67, 72, 127-136
Catharus ustulatus, 69, 71, 75-77
Centurus uropygialis, 72
Cepphus columba, 17, 19
Cerorhinca monocerata, 13-20
Chamaea fasciata, 68, 71, 72
Charadrius alexandrinus, 22
  semipalmatus, 22
  vociferus, 22, 67
Chat, Yellow-breasted, 69, 76
Chickadee, Black-capped, 72
  Chestnut-backed, 72
  Mountain, 86
Chlidonias niger, 59
Chondestes grammacus, 69
Chordeiles acutipennis, 31, 67
Ciconia ciconia, 129
Coccyzus americanus, 67, 70, 75, 77
Colaptes auratus, 68
  a. chrysoides, 72
Columbigallina passerina, 72
Contopus sordidulus, 68, 71, 75-77
Cormorant, Brandt's 17
  Double-crested, 67, 70
Corvus, brachyrynchos, 97-98
  corax, 98
  corone, 98
  moneduloides, 98
Cowbird, Brown-headed, 69, 75-77
Crow, Carrion, 98
  Common, 97-98
  New Caledonian, 98
Cuckoo, Yellow-billed, 67, 70, 75, 77
Cyanocitta stelleri, 72
Cyrtonyx montezumae, 54
Dendrocopos nuttallii, 68
  pubescens, 68
  scalaris, 72
  villosus, 72
Dendroica castanea, 57
  coronata auduboni, 83-89
  c. coronata, 86, 87, 89
  graciae, 50
  nigrescens, 83, 86-89
  occidentalis, 83-89
  petechia, 69, 71, 75-77, 83, 85, 87, 89
  townsendi, 83, 86, 87, 89
Dove, Ground, 72
  Mourning, 67
Dowitcher, 2
Duck, Wood, 67
Dunlin, 1-12
Eagle, Bald, 98
Egret, Great, 67, 72, 127-136
Elanus leucurus, 67
Elliott, William P., see Hoffman, Wayne and—

Empidonax difficilis, 68, 70, 75-77
"griseus", 48
oberholseri, 48
traillii 68, 70, 75-77
wrightii, 47-48
Euphagus carolinus, 30
cyanocephalus, 69
Falco sparverius, 67
Finch, House, 69, 76
Purple, 72
Flicker, Common, 68
"Gilded", 72
Flycather, Ash-throated, 68, 76
Dusky, 48
Gray, 47-48
Vermilion, 72
Western, 68, 70, 75-77
Willow, 68, 70, 75-77
"Wright", 48
Gaines, David, A new look at the nesting riparian avifauna of the Sacramento Valley, California, 61-80
Garrett, Kimball L., see Johnson, Ned K. and—
Gavia adamsii, 23, 111-126
arctica, 120
immer, 111-125
stellata, 120
Geothlypis trichas, 69, 71, 75-77
Glaucidium gnoma, 102, 107
Gnatcatcher, Blue-gray, 69, 71, 75-77
Goldfinch, American, 69, 76
Lesser, 69, 76
Greenberg, Russell, Todd Keeler-Wolf and Virginia Keeler-Wolf, Wood Warbler populations in the Yolla Bolly Mountains of California, 81-90
Grosbeak, Black-headed, 69, 76
Blue, 69
Grouse, Ruffed, 72, 138, 139
Guillemot, Pigeon, 17, 19
Guiraca caerulea, 69
Gull, Glaucous-winged, 17-19
Pacific, 98
Western, 17-19
Gypaetus barbatus, 98
Haliaeetus leucocephalus, 98
Hawk, Cooper's, 67, 70, 75, 77
Harris', 72
Red-shouldered, 67, 70, 75, 77
Red-tailed, 67
Heron, Black-crowned Night, 67
Great Blue, 67, 72, 127-136
Green, 67
Hoffman. Wayne and William P. Elliott, Occurrence of intergrade Brant in Oregon, 91-93
Hoffman, Wayne, see Scott, J. Michael, et al.
Hummingbird, Anna's, 67
Black-chinned, 67
Broad-tailed, 46-47
Hylocichla ustulata, 69, 71, 75-77
Icteria virens, 69, 76
Icterus galbula, 69, 76
Iridoprocne bicolor, 68, 76
Jay, Scrub, 68, 72, 76
Steller's, 72
Johnson, Eric V., see Johnston, David S. and—
Johnson, Ned K. and Kimball L. Garrett, Interior bird species expand breeding ranges into southern California, 45-56
Johnston, David S. and Eric V. Johnson, Albino Rock Wren, 21
Junco, Dark-eyed, 86, 87
Junco, hyemalis oreganus, 86, 87
Keeler-Wolf, Todd, see Greenberg, Russell et al.
Keeler-Wolf, Virginia, see Greenberg, Russell et al.
Kestrel, American, 67
Killdeer, 22, 67
Kingbird, Eastern, 72
Tropical, 30
Western, 68, 76
Kingfisher, Belted, 68
Kite, White-tailed, 67
Kittiwake, Black-legged, 133
Lammergeier, 98
Larus glaucescens, 17-19
occidentalis, 17-19
pacificus, 98
Limnodromus, 2
Loon, Arctic, 120
Common, 111-125
Red-throated, 120
Yellow-billed, 23, 111-126
Lophortyx californicus, 67, 72
Lunda cirrhata, 13
Magpie, Black-billed, 72
Yellow-billed, 68
Maple, Terry, Do crows use automobiles as nutcrackers?, 97-98
Martin, Purple, 68, 76
Meadowlark, Western, 69
Megaceryle alcyon, 68
Melanerpes formicivorous, 68, 72

Melospiza melodia, 69, 71, 75-77
Merganser, Common, 67, 70, 75, 77
Mergus merganser, 67, 70, 75, 77
Micrathene whitneyi, 102, 106
Mimus polyglottos, 68
Mockingbird, 68
Molothrus ater, 69, 75-77
Morris, James R., Jr., Breeding record for the Semipalmated Plover at Ocean Shores, Washington, 22
Murre, Common, 17, 137
Thick-billed, 137
Myiarchus cinerascens, 68, 76
Myioborus pictus, 50-51, 94-96
Nehls, Harry B., see Scott, J. Michael and—
Nighthawk, Lesser, 31, 67
Nuthatch, White-breasted, 68, 72
Nycticorax nycticorax, 67
Oceanodroma, 17
Oporornis tolmiei, 72, 83, 86, 87, 89
Oriole, Northern, 69, 76
Otus asio, 28, 67
flammeolus, 25-44
f. rarus, 34
Owl, Barn, 102, 104
Barred, 138-140
Elf, 102, 106
Flammulated, 25-44
Great Gray, 103, 110
Great-horned, 67, 102, 105
Long-eared, 67, 70, 103, 109
Pygmy, 102, 107
Screech, 28, 67
Short-eared, 103, 110
Spotted, 102, 108
Page, Gary, Age, sex, molt and migration of Dunlins at Bolinas Lagoon, 1-12
Parabuteo unicinctus, 72
Parulidae, 30
Parus atricapillus, 72
gambeli, 86
inornatus, 68, 76
rufescens, 72
Passerella iliaca, 72
Passerina amoena, 69, 76
Perry, Michael L., see Behle, William H. and—
Phalacrocorax auritus, 67, 70
penicillatus, 17
Phalaenoptilus nuttallii, 31
Phasianus colchicus, 67
Pheasant, Ring-necked, 67
Pheucticus melanocephalus, 69, 76
Phoebe, Black, 68
Pica nuttalli, 68
pica, 72
Pipilo aberti, 76
erythrophthalmus, 69
fuscus, 69
Piranga flava hepatica, 51-53
rubra, 72
Plover, Semipalmated, 22
Snowy, 22
Polioptila caerulea, 69, 71, 75-77
Poor-will, 31
Pratt, Helen M., Breeding of Great Blue Herons and Great Egrets at Audubon Canyon Ranch, California, 1972-1973, 127-136
Progne subis, 68, 76
Psaltriparus minimus, 68, 76
Ptychoramphus aleuticus, 17
Puffin, Tufted, 13
Pyrocephalus rubinus, 72
Quail, California, 67, 72
Montezuma, 54
Scaled, 54
Raven, Common, 98
Redstart, Painted, 50-51, 94-96
Reichard, Timothy A., Barred Owl sightings in Washington, 138-140
Remsen, J. V., Jr., see Binford, Laurence C. and—
Riparia riparia, 68, 76
Rissa tridactyla, 133
Robin, 69, 76
Salpinctes obsoletus, 21
Sandpiper, Least, 1, 4, 5, 8
Spotted, 67, 70, 75, 77
Western, 1, 2, 4, 5, 8
Sapsucker, Yellow-bellied, 72
Sayornis nigricans, 68
Schulenberg, Tom and Steve Summers, A Blue-winged x Golden-winged Warbler in California, 58
Scott, J. Michael, Wayne Hoffman, David Ainley and C. Fred Zeillemaker, Range expansion and activity patterns in Rhinoceros Auklet, 13-20
Scott, J. Michael and Harry B. Nehls, First Oregon records for Thick-billed Murre, 137
Selasphorus platycercus, 46-47
Setophaga picta, 50-51, 94-96
Simon, David and Winifred F. Simon, A Yellow-billed Loon in Baja California, Mexico, 23
Simon, Winifred F., see Simon, David and—

Sitta carolinensis, 68, 72
Skaar, P. D., First Least Tern in Montana, 59
Small, Arnold, Western bird photographers, 101-110
Sparrow, Chipping, 86, 87
Fox, 72
Lark, 69
Song, 69, 71, 75-77
Sphyrapicus varius, 72
Spinus psaltria, 69, 76
tristis, 69, 76
Spizella passerina, 86, 87
Starling, 69, 71, 75-77
Stelgidopteryx ruficollis, 59, 68, 76
Sterna albifrons, 59
Stork, White, 129
Storm-petrel, 17
Strigiformes, 31
Strix nebulosa, 103, 110
occidentalis, 102, 108
varia, 138-140
Sturnella neglecta, 69
Sturnus vulgaris, 69, 71, 75-77
Summers, Steve, see Schulenberg, Tom and—
Swallow, Bank, 68, 76
Rough-winged, 59, 68, 76
Tree, 68, 76
Tanager, Hepatic, 51-53
Summer, 72
Tern, Black, 59
Least, 59
Thrush, Swainson's, 69, 71, 75-77
Thryomanes bewickii, 68-76
Titmouse, Plain, 68, 76
Towhee, Abert's, 72
Brown, 69
Rufous-sided, 69
Troglodytes aedon, 68, 76
Trogon, Coppery-tailed, 54
Trogon elegans, 54
Turdus migratorius, 69, 76
Tyrannus melancholicus, 30
tyrannus, 72
verticalis, 68, 76
Tyto alba, 102, 104
Unitt, Philip, Painted Redstarts attempt to breed in California, 94-96
Uria aalge, 17, 137
lomvia, 137
Vermivora celata 72, 83-85, 87-89
c. celata, 85, 87, 89
c. lutescens, 83-85, 87, 89
c. orestera, 85, 87, 89
c. sordida, 87
chrysoptera, 58
pinus, 58
pinus x V. chrysoptera, 58
ruficapilla, 83-85, 87, 89
virginiae, 49-50
Vireo bellii, 69, 71, 75-77
huttoni, 69, 71
gilvus, 69, 71, 75-77
solitarius, 72
s. plumbeus, 48-49
s. cassinii, 49
Vireo, Bell's, 69, 71, 75-77
Hutton's, 69, 71
Solitary, 48-49, 72
Warbling, 69, 71, 75-77
Vireonidae, 30
Warbler, Bay-breasted, 57
Black-throated Gray, 83, 86-89
Blue-winged, 58
Blue-winged x Golden-winged, 58
Golden-winged, 58
Grace's, 50
Hermit, 83-89
MacGillivray's, 72, 83, 86, 87, 89
Nashville, 83-85, 87, 89
Orange-crowned, 72, 83-85, 87-89
Townsends, 83, 86, 87, 89
Yellow, 69, 71, 75-77, 83, 85, 87, 89
Yellow-rumped, 83-89
Virginia's, 49-50
Wilson's, 72, 83, 86, 87, 89
Whip-poor-will, 46
Wilsonia pusilla, 72, 83, 86, 87, 89
Winter, Jon, The distribution of the Flammulated Owl in California, 25-44
Wood Pewee, Western, 68, 71, 75-77
Woodpecker, Acorn, 68, 72
Downy, 68
Gila, 72
Hairy, 72
Ladder-backed, 72
Nuttall's, 68
Wren, Bewick's, 68, 76
House, 68, 76
Rock, 21
Wrentit, 68, 71, 72
Yellowthroat, Common, 69, 71, 75-77
Zeillemaker, C. Fred, see Scott, J. Michael, et al.
Zenaidura macroura, 67

WESTERN BIRDS

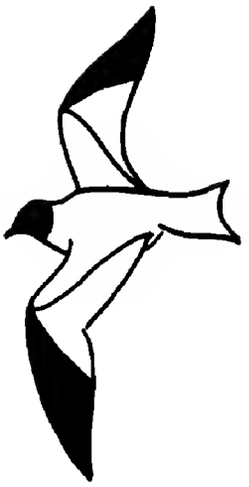

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TABLE OF CONTENTS
VOLUME 5, 1974

Volume 5, Number 1, 1974

Age, Sex, Molt and Migration of Dunlins at Bolinas Lagoon *Gary Page* 1

Range Expansion and Activity Patterns in Rhinoceros Auklets *J. Michael Scott, Wayne Hoffman, David Ainley and C. Fred Zeillemaker* 13

NOTES

Albino Rock Wren *David S. Johnston and Eric V. Johnson* 21

Breeding Record for the Semipalmated Plover at Ocean Shores, Washington *James R. Morris, Jr.* 22

A Yellow-billed Loon in Baja California, Mexico *David Simon and Winifred F. Simon* 23

Volume 5, Number 2, 1974

The Distribution of the Flammulated Owl in California *Jon Winter* 25

Interior Bird Species Expand Breeding Ranges into Southern California *Ned K. Johnson and Kimball L. Garrett* 45

NOTES

A Record of the Bay-breasted Warbler from Utah *William H. Behle and Michael L. Perry* 57

A Blue-winged x Golden-winged Warbler in California *Tom Schulenberg and Steve Summers* 58

First Least Tern in Montana *P. D. Skarr* 59

Volume 5, Number 3, 1974

A New Look at the Nesting Riparian Avifauna of the Sacramento Valley, California *David Gaines* 61

Wood Warbler Populations in the Yolla Bolly Mountains of California *Russell Greenberg, Todd Keeler-Wolf and Virginia Keeler-Wolf* 81

NOTES

Occurrence of Intergrade Brant in Oregon *Wayne Hoffman and William P. Elliott* 91

Painted Redstarts Attempt to Breed in California *Philip Unitt* 94

Do Crows Use Automobiles as Nutcrackers? *Terry Maple* 97

Volume 5, Number 4, 1974

Western Bird Photographers *Arnold Small* 101

Identification of the Yellow-billed Loon (*Gavia adamsii*)
Laurence C. Binford and J. V. Remsen, Jr. 111

Breeding of Great Blue Herons and Great Egrets at Audubon Canyon Ranch, California, 1972-1973 *Helen M. Pratt* 127

NOTES

First Oregon Records for Thick-billed Murre
J. Michael Scott and Harry B. Nehls 137

Barred Owl Sightings in Washington *Timothy A. Reichard* 138

INDEX 141

CORRIGENDA

Volume 4:104, 1973: line 51, *P. olivacea* vice *rubra.*
Volume 5:94, 1974: Figure 1 inverted in printing.

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